

CONCRETE DESIGN CALCULATOR: Quiz-4 Solution Section (3)



Select Strength:	$f_y = 60000 \text{ psi}; f_c = 4000 \text{ psi}$	Select design $\rho$ :	$\rho_{max}$	Select Load Case:	$1.2D + 1.4L$
$f_y = 60000$	$F_y = 4000$	Design $\rho = 0.0069$		Est $w_s$ [k/ft] = 1.78	
$\rho_{max} = 0.0033$	$\rho_{max} = 0.0181$	Design $R_n = 388.79$		$M_u$ [ft-k] = 227.8	
$R_n$ of $\rho_{max}$ [psi] = 192.2	$R_n$ of $\rho_{max}$ [psi] = 952.0	$b_w d^3 = 7813.549$		$M_u$ [ft-k] = 253.2	
		$d = 22.10$		Density [pcf] 150	

Enter Givens & Estimates:

$w_s$ [k/ft]	0.55	$b_w$ [in]	16	$b_{eff}$ [in]	80
$w_s$ [k/ft]	0.4	$h$ [in]	27	$t$ [in]	3
Length [ft]	32	$d$ [in]	24	$a$ [in]	0.49
Clear Cover [in]	3	$A_g$ [in <sup>2</sup> ]	2.65	$\beta_1$	0.85
Est Self Wt [pcf]	400	$A_{g,max}$ [in <sup>2</sup> ]	1.214	$c$ [in]	0.57
Actual Self Wt [pcf]	450.00	$A_{g,max}$ [in <sup>2</sup> ]	1.280	$e_t$	0.1227
		$\phi M_u$ [ft-k]	253.36		

Neutral Axis Calculations:

T [kips]	142.2	$z$ [in] =	21.60
$A_g$ [in <sup>2</sup> ]	41.8	$z$ [in] =	22.50
$A_{g,req}$ [in <sup>2</sup> ]	240	Governing $z$	22.50

N.A. is in the flange

Select  $A_s$  in Tension:

BAR	Qty	$A_s$ [in <sup>2</sup> ]
#8	3	2.37

If  $a < ht$

$A_s$ [in <sup>2</sup> ]	2.6496
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If $a > t$	
$A_{s,req}$ [in <sup>2</sup> ]	10.88
$M_{u,max}$ [k-ft]	1224.00
$M_{u,req}$ [k-ft]	996.16
$R_n$	1441.20
$\rho_s = 0.03$	
$a$ [in]	14.64
$c$ [in]	17.22
$e_t$	0.00
$A_{s,req}$ [in <sup>2</sup> ]	13.27
$A_s$ [in <sup>2</sup> ]	24.15

Bar Selection:

BAR	Number of Bars in a Single Layer of Reinforcing													
	2		3		4		5		6		7		8	
	Area	Width	Area	Width	Area	Width	Area	Width	Area	Width	Area	Width	Area	Width
#4	0.39	6.80	0.58	8.30	0.78	9.80	0.98	11.30	1.18	12.80	1.37	14.30	1.57	15.80
#5	0.61	6.90	0.91	8.50	1.23	10.20	1.55	11.80	1.84	13.4	2.15	15.00	2.45	16.70
#6	0.88	7.00	1.32	8.80	1.77	10.50	2.21	12.30	2.65	14.00	3.09	15.80	3.53	17.50
#7	1.20	7.20	1.80	9.00	2.41	10.90	3.01	12.80	3.61	14.70	4.21	16.50	4.81	18.40
#8	1.57	7.30	2.35	9.30	3.14	11.30	3.93	13.30	4.71	15.30	5.50	17.30	6.28	19.30
#9	2.00	7.60	3.00	9.80	4.00	12.10	5.00	14.30	6.00	16.60	7.00	18.80	8.00	21.10
#10	2.53	7.80	3.79	10.40	5.06	12.90	6.33	15.50	7.59	18.00	8.86	20.50	10.12	23.10
#11	3.12	8.10	4.68	10.90	6.25	13.80	7.81	16.60	9.37	19.40	10.94	22.20	12.50	25.00
#14	4.50	8.90	6.75	12.30	9.00	15.70	11.25	19.00	13.50	22.40	15.75	25.80	18.00	29.20
#18	8.00	10.60	12.00	14.10	16.00	19.60	20.00	24.50	24.00	28.80	28.00	33.10	32.00	37.70

# Civil Engineering Material Calculation

**Terry C. Jones**



## **Civil Engineering Material Calculation:**

*Handbook of Civil Engineering Calculations, Second Edition* Tyler G. Hicks, S. David Hicks, 2007-05-23 Table of Contents Preface How to Use This Handbook Sect 1 Structural Steel Engineering and Design Sect 2 Reinforced and Prestressed Concrete Engineering and Design Sect 3 Timber Engineering Sect 4 Soil Mechanics Sect 5 Surveying Route Design and Highway Bridges Sect 6 Fluid Mechanics Pumps Piping and Hydro Power Sect 7 Water Supply and Stormwater System Design Sect 8 Sanitary Wastewater Treatment and Control Sect 9 Engineering Economics Index 1

*Advances in Materials and Manufacturing Technology* Ramesh Kumar Nayak, J. Paulo Davim, Rajiv Shekhar, Geoffrey Mitchell, 2026-01-01 This book comprises select proceedings of the 3rd International conference on Advances in Materials and Manufacturing Technology ICAMMT 2024 Functional materials smart materials and intelligent materials stand as foundational elements in twenty first century technology irrespective of their designation The evolution of modern structural materials reflects an unprecedented trajectory of scientific and technological progress The book discusses the latest materials manufacturing processes evaluation of materials properties for the application in automotive aerospace marine locomotive and energy sectors The topics covered include advanced metal forming bending welding and casting techniques recycling and re manufacturing of materials and components materials processing characterization and applications multi physics coupling simulation and optimization alternate materials material substitution thermally enhanced processes and materials composites and polymer manufacturing the fabrication process of nanomaterial powder metallurgy and ceramic forming numerical modelling and simulation advanced machining processes functionally graded materials non destructive examination optimization techniques engineering materials heat treatment material testing MEMS integration energy materials bio materials metamaterials metallography nanomaterial SMART materials application of AI and ML in advanced materials automation and superalloys In addition it discusses industrial applications and cover theoretical and analytical methods numerical simulations and experimental techniques in the area of advanced materials and their applications The recognition of benefits restricting from advanced materials and structures transcends various applications Smart systems offer a streamlined approach to controlling material and system characteristics by autonomously adapting to environmental changes Mechanistic comprehension across disciplines is paramount for developing materials with capabilities that surpass current standards Our conference serves as a cross disciplinary summit transcending organizational and global barriers to integrate research and education in the vital field of advanced materials We focus on major sectors including advanced processing material characterization modelling and simulation properties performance and device fabrication aiming to overlay the way for the next wave of scientific and technological advancements

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of Construction Materials Per Freiesleben Hansen,2009-09-18 The Science of Construction Materials is a study and work book for civil engineering students It includes a large number of thoroughly prepared calculation examples The book is also suitable for self study for the researcher and practicing civil engineer     **Atchley's Civil Engineer's and Contractor's Estimate and Price Book for home or foreign service ... In two parts** W. Davis HASKOLL,1873     Atchley's Civil Engineer's and Contractor's Estimate and Price Book, for Home Or Foreign Service, Etc William Davis Haskoll,1872     Civil Engineering and Disaster Prevention Abhijit Mohanrao Zende,Xin Ren,Qingfei Gao,2023-10-25 Civil Engineering and Disaster Prevention focuses on the research of civil engineering architecture and disaster prevention and control These proceedings gather the most cutting edge research and achievements aiming to provide scholars and engineers with valuable research direction and engineering solutions Subjects covered in the proceedings include Civil Engineering Engineering Structure Architectural Materials Disaster Prevention and Control Building Electrical Engineering The works of these proceedings aim to promote the development of civil engineering and environment engineering Thereby fostering scientific information interchange between scholars from the top universities research centers and high tech enterprises working all around the world     Atchley's civil engineer's and contractor's estimate and price book. [4 issues]. William Davis Haskoll,1871     **Life Cycle Analysis and Assessment in Civil Engineering: Towards an Integrated Vision** Robby Caspeepe,Luc Taerwe,Dan Frangopol,2018-10-31 This volume contains the papers presented at IALCCE2018 the Sixth International Symposium on Life Cycle Civil Engineering IALCCE2018 held in Ghent Belgium October 28 31 2018 It consists of a book of extended abstracts and a USB device with full papers including the Fazlur R Khan lecture 8 keynote lectures and 390 technical papers from all over the world Contributions relate to design inspection assessment maintenance or optimization in the framework of life cycle analysis of civil engineering structures and infrastructure systems Life cycle aspects that are developed and discussed range from structural safety and durability to sustainability serviceability robustness and resilience Applications relate to buildings bridges and viaducts highways and runways tunnels and underground structures off shore and marine structures dams and hydraulic structures prefabricated design infrastructure systems etc During the IALCCE2018 conference a particular focus is put on the cross fertilization between different sub areas of expertise and the development of an overall vision for life cycle analysis in civil engineering The aim of the editors is to provide a valuable source of cutting edge information for anyone interested in life cycle analysis and assessment in civil engineering including researchers practising engineers consultants contractors decision makers and representatives from local authorities     *A Text-book on Ceramic Calculations* Willie Jackson,1904     **Proceedings** ,1916     Catalogs of Instruments and Materials for Civil Engineering, Surveying and Drawing Manufactured and Sold by this Company May be Found on the Shelves Under the Above Call Number William E. Stieren,     **The Rudiments of Civil Engineering** Henry Law,1882     *Structural Engineers' Handbook* Milo Smith Ketchum,1924     Civil Engineering Calculations Reference Guide Tyler Gregory Hicks,Max Kurtz,1987

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